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Report No. 73-1-16

November 1972
5230

AN EVALUATION OF A PITCH CANKER OUTBREAK IN A FLORIDA SLASH PINE PLANTATION

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ABSTRACT

A Florida slash pine plantation found to be severely infected with pitch canker in 1969 was assessed as to the increase or decline of the disease over the next two years. The results definitely demonstrate that slash pine plantations severely infected with pitch canker are capable of rapid recovery.

INTRODUCTION

Pitch canker was first noted in the United States on Virginia pine (*Pinus virginiana* Mill.) near Asheville, North Carolina, in 1945 (Hepting and Roth, 1946). At the time the causal agent was unknown and remained so until 1949, when the fungus causing the disease was described as *Fusarium lateritium f. pini* Hepting (Snyder et al., 1949).

The disease has since been found on shortleaf (*P. echinata* Mill.), longleaf (*P. palustris* Mill.), Scotch (*P. sylvestris L.*), Table Mountain (*P. pungens* Lamb.), and both varieties of slash pine (*P. elliottii* Engelm. var. *elliottii* and var. *densa* Little and Dorman). Diseased trees have been reported from Virginia to Florida and as far west as Mississippi and Tennessee. Loblolly pine (*P. taeda L.*) appears to be resistant (Berry and Hepting, 1959).

Symptoms on all pines are easily detected as sunken cankers on the bole which exude a copious flow of pitch. The wood beneath the canker is heavily soaked with pitch. The disease appears to be more virulent

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on slash pine than other pine species. In addition to typical bole cankers, slash pine terminal and branch leaders are often attacked resulting in death of the leader above the canker. Cankers on the leaders are not sunken, but do exude pitch (Fig. 1). Wood beneath the leader cankers does exhibit the typical heavy concentration of pitch (Fig. 2). Severely attacked trees may die within a year while others suffer varying growth loss depending on severity of attack.

Pitch canker damage in natural stands of South Florida slash pine, (*P. elliottii* var. *densa*), has been appraised by Bethune and Hepting (1963). They evaluated sixteen 1/4-acre plots over a period of five years (1955-56 to 1960-61). In general, they found that the number of trees infected increased from 3 percent to 16 percent during the 5-year period. During the course of the study 7.9 percent of the pitch cankered trees died. They noted that trees that were not killed were often malformed by the disease.

During the summer of 1969, an aerial detection survey by the Florida Division of Forestry detected an unusual amount of discoloration in a 200-acre 11-year-old slash pine plantation (the Beazley Tract) near Lake Butler in Union County. The problem was subsequently diagnosed as resulting from a high incidence of terminal and branch leader dieback due to pitch canker. Several other plantations in the area were found to be infected also, when ground surveys were made during the next several months. However, none of the plantations were attacked as severely as the Beazley Tract.

The Beazley Tract was first visited in December of 1969. At that time, it was obvious that the disease had reached epidemic proportions in much of the plantation. Infection approached 50 percent and it appeared that many of the trees would be eliminated as crop trees. The main concern was if the 11-year-old plantation had been destroyed as a profitable economic investment for the landowner, i.e., would the damage continue to increase or would the stand recover and produce a harvestable crop? In order to answer these questions a systematic series of permanent plots were established throughout the stand. The plots were to be evaluated periodically until a definite disease trend could be established.

METHODS

A system of permanent plots was established to give a 2-percent sample of the plantation. Every 50th row in the plantation was designated as a main sample line. Twenty-five tree plots were established by traversing the sample line a distance of 25 trees into the plantation

Fig. 1. Pitch canker on slash pine leader.

Fig. 2. Heavy pitch soak of the wood beneath a pitch canker.

and establishing a 5 by 5 tree square plot. Additional plots were spaced 25 trees apart as the sample line (or plantation row) was traversed. In all 80, twenty-five tree plots were established. At the time of the first evaluation (February 1970) the trees were rated as:

1. Dead
2. Top 1/3 or more of crown dead
3. Number of dead branches per whorl in trees with less than 1/3 of crown dead
4. Bole canker only
5. Healthy

In subsequent evaluations a column was added to the data sheets for a tally of the number of new branches infected on trees which had shown infection in previous evaluations.

Evaluations were made in February and June of 1970 and in July of 1971. An evaluation was initiated in February of 1971 but was terminated as it soon became obvious no change in disease damage had occurred between June of 1970 and February of 1971. Apparently most new damage in any year appears in the spring and early summer of the year.

RESULTS

The total number of infected trees observed on the three dates of evaluation are presented in Table 1. As previously mentioned, the disease was first detected in the summer of 1969. The infection that was recorded in February was essentially the same that was present the previous summer since most new flags resulting from terminal and branch leader killing occur in the spring. Indications are based on the low increase of new infections detected in June 1970 and August 1971 that infection probably reached its peak during the spring of 1969.

Not only did the infection rate decrease but the number of trees severely damaged (trees with one-third or more of their crown destroyed) did not increase substantially after the first evaluation. This is reflected in Table 2 which depicts the percent found of trees severely damaged on each evaluation date. Note that between June of 1970 and August of 1971, there is a decrease in the number of trees considered to be severely damaged. This resulted from rapid growth and development of branch leaders of the lower crown.

Table 1. Trees found to be infected by pitch canker in February 1970, June 1970, and August 1971.

Month and Year of Survey	TREES OBSERVED TO BE INFECTED			
	Current Year		Change from previous year	
	Number	Percent*	Number	Percent
February 1970	673	33.6	--	--
June 1970	787	39.4	114	5.6
August 1971	871	43.5	84	4.1

*Based on 2 percent sample of plantation consisting of 2,000 trees (80 twenty-five tree plots).

Table 2. Trees found to be severely damaged by pitch canker in the February 1970, June 1970, and August 1971 evaluations.

Month and Year Surveyed	TREES SEVERELY DAMAGED*			
	Current Year		Change from previous year	
	Number	Percent	Number	Percent
February 1970	106	5.3	--	--
June 1970	152	7.6	46	2.3
August 1971	135	6.8	-17	-0.8

*Trees severely damaged consisted of all trees with more than a top 1/3 of their dead at the time of the survey.

As indicated in Table 3, only 8.5 percent of the trees infected in previous years showed new symptoms (new branch death) in August of 1971. This merely demonstrates that infected trees were generally rapidly recovering. Table 4 depicts the total number of trees lost as crop trees due to the disease. The data is further separated by mortality and trees still living but lost as crop trees.

Table 3. Previously infected trees still showing new symptoms (branch death) in June 1970 and August 1971.

Month and Year Surveyed	Total Infected	Infected Trees Showing New Infections in June 1970 and August 1971	
		Number	Percent
February 1970	673	-	-
June 1970	787	83	12.3
August 1971	871	67	8.5

Table 4. Tree mortality and damage beyond recovery as a crop tree due to pitch canker (2 percent sample consisting of 2,000 trees).

Survey Date	Mortality		Living Trees Lost as Potential Crop Trees		Total Trees Lost	
	Number	Percent	Number	Percent	Number	Percent
February 1970	20	1.0	86	4.3	106	5.3
June 1970	67	3.4	85	4.2	152	7.6
August 1971	103	5.1	32	1.7	135	6.8

The increase found in mortality in August 1971 was in every case in trees that had been initially attacked during the 1969 growing season.

DISCUSSION

By August of 1971, it was very apparent that the whole stand was rapidly recovering from the severe outbreak of 1969. In 1969, considerable acreage in the plantation contained trees with considerable portions of their crowns turned bright reddish brown from the disease. By August of 1971, the disease was rather inconspicuous to the natural eye. Dead terminal snags were often nearly completely hidden by new growth from a lateral branch which had taken over terminal dominance. Only a few red flags were observed on trees widely scattered throughout the plantation. The only evidence that remained of the earlier

severe attack was crooks in the tops where lateral branches had replaced the dead terminal leaders.

Our results support these observations that the stand has essentially recovered and should be considered capable of producing a good harvestable pulpwood crop. However, due to a substantial amount of bole malformation on cankered trees in the stand, sawlog management has been rendered impractical. It should also be pointed out that due to a substantial amount of bole cankers on residual trees in the stand, there may be a continuing reservoir of inoculum for future outbreaks if conditions again become optimum for spore production, dispersal, and host infection. At the present time there is no information available to predict what the risk of another outbreak might be.

The primary conclusion of this work is that slash pine plantations severely attacked by pitch canker are capable of recovering to produce at least harvestable pulpwood crop.

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